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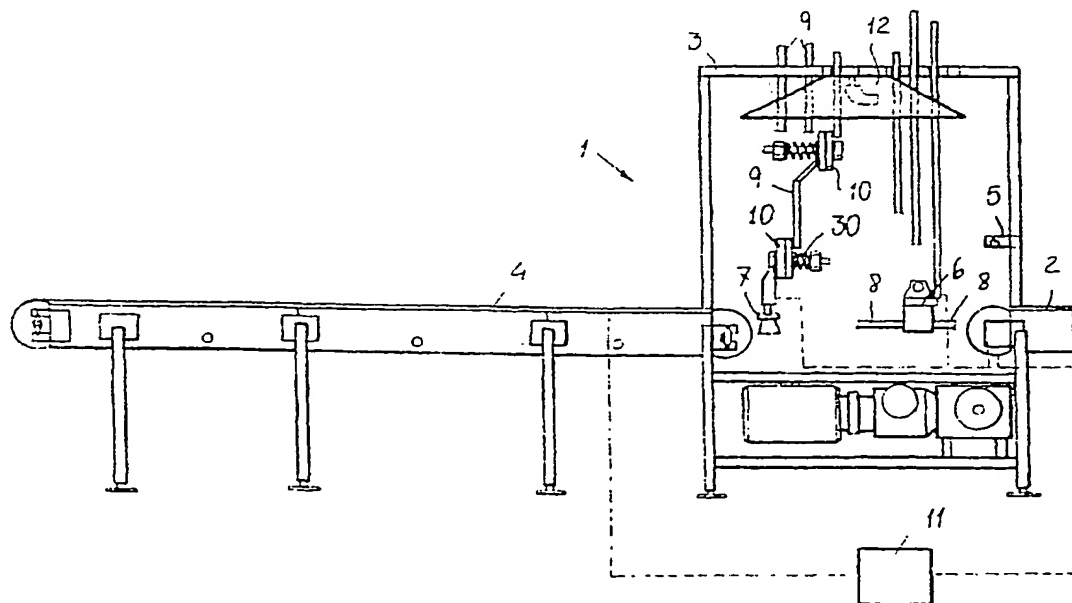
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(54) Title: PLANT FOR DECORATING METAL SURFACE



(57) Abstract: A plant (1) for decorating metal surfaces, characterised by comprising first means (6) for depositing a coating material on a surface to be decorated, and second means (7) for spreading said coating material to form a predetermined decoration, said first means (6) and said second (7) being arranged to operate in succession.

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PLANT FOR DECORATING METAL SURFACE.

This invention relates to a plant for decorating metal surface.

In particular, the invention relates to a plant which enables liquid
5 coatings and/or coatings in the form of powder suspended in a liquid vehicle
to be applied to aluminium profile bars for door or window structures, to give
them an appearance similar to wood.

Currently, the methods mostly used for treating the metal surfaces of
profile bars are:

- 10 - photofilm application,
- the application of a PVC facing reproducing wood veining,
- silk-screen printing,
- powder-on-powder application with brushing treatment,
- the application of coating materials suspended in a liquid vehicle on a
15 powder base.

To apply a "wooden" decoration by known methods, the procedure is
as follows.

In photofilm application, a first coating layer forming the background
colour is firstly applied to the profile bar by means of powder or liquid. A film
20 reproducing the wood veining is then applied to the background.

This method gives a result which is of unsatisfactory appearance
because of the excessive uniformity of the decoration and the consequent
poor similarity with natural wood. Applying a PVC facing consists essentially
of forming, by traditional methods, a PVC film reproducing wood veining.

25 The film is then glued to metal profile bar.

This method has also proved unsatisfactory, as the resultant appearance is not similar to natural wood.

With silk-screen printing, a first coating layer forming the background colour is firstly applied to the profile bar. After a pre-polymerization heat treatment, a layer of powders reproducing wood veining is then applied via
5 masking covers. The coating cycle is completed by a polymerization heat treatment.

Powder-on-powder application with brushing treatment consists of a mechanical action on a second powder layer, enabling the desired decoration
10 to be obtained. After a pre-polymerization heat treatment, a second powder layer is deposited on the background and finished by brushing. The coating cycle is then completed by polymerization heat treatment.

This method results in an unsatisfactory appearance, as it produces continuous uniform lines on the profile bar surface, caused by the brushing.

15 The application of coating materials suspended in a liquid vehicle on a powder base requires four steps.

The first step is to apply onto the surface to be decorated, previously subjected to chemical conversion treatment, a layer of powder coating material of colour corresponding to the desired background for the decoration
20 to be obtained.

The second step is to heat the treated surface to a temperature lower than the melting point of the powder coating material, but sufficient to fix it to the metal surface.

The third step is to apply to the prepared surface, by manual
25 application, a coating material suspended in a liquid vehicle to visualize wood veining.

The fourth step is to bake the profile bar at a temperature of about 180°C for 20 minutes.

This latter method is more able than the others to give the profile bar a variable outer appearance, which is hence very similar to wood.

5 However, the method is very costly.

In particular the third coating application step, which is exclusively manual, involves very high cost and limited productivity.

Moreover the result depends on the expertise of the operator, and hence the quality of the finished piece is variable in that the surface of the decorated profile bar sometimes presents surface defects, due to the
10 considerable variability of manually produced veining.

In the working environment the risks to the health of the plant operators are very high; in this respect, only solvent-containing products are used, these being notoriously damaging to human health.

15 These risks are considerably accentuated by the fact that the coating is applied manually, as stated.

The technical aim of the present invention is therefore to provide a plant for decorating metal surfaces which eliminates the stated drawbacks.

Within the scope of this technical aim, one object of the invention is to
20 provide a plant which is economical while at the same time enabling the work to be carried out with very high productivity.

Another object of the invention is to provide a plant enabling profile bars to be decorated with a very high quality which is constant with time. In particular, those profile bars treated by the plant of the invention present a
25 finished surface substantially free of surface defects.

A further object of the invention is to provide a plant which is very safe for operator health.

A further object of the invention is to provide a plant for decorating metal surfaces which is substantially simple and reliable.

5 These and further objects are attained according to the invention by a plant for decorating metal surfaces in accordance with claim 1.

Further characteristics of the present invention are defined in the subsequent claims.

Advantageously, the plant of the invention is totally automated, with
10 the result that its working does not include steps which have to be carried out manually, other than the loading and unloading of the profile bars under treatment, and even this can be automated.

Further characteristics and advantages of a plant of the invention for decorating metal surfaces will be more apparent from the ensuing description
15 with reference to the single accompanying drawing, which represents a schematic partial side elevation of a plant of the present invention.

The sole figure shows a plant for decorating metal surfaces indicated overall by the reference numeral 1.

The plant 1 comprises a first conveyor belt 2 which feeds the articles
20 to be decorated, such as profile bars, plates and metal articles in general, into a coating cabin 3, and a second conveyor belt 4 which carries the decorated articles out of the cabin 3.

At one end of the conveyor 2, the plant 1 presents a photoelectric cell
5, arranged to sense the presence of the articles to be decorated, to operate
25 one or more sprayers 6 and brushes or miscellaneous implements 7 housed in the cabin 3.

In the example, the plant 1 presents three sprayers 6 and three brushes or miscellaneous implements 7 (only one sprayer and one brush are shown), which operate on an upwardly facing surface of a profile bar under treatment and on two lateral surfaces respectively.

5 Preferably the brushes or miscellaneous implements 7 are positioned immediately downstream of the sprayers 6.

The sprayers 6 are connected by conduits 8 to a pressurized cup (not shown) of one or more litres capacity closed hermetically by a lid. This cup contains the coating material of product for the decoration.

10 The conduits 8 are closed at the sprayers 6 by pistons (not shown) connected to a pneumatic circuit.

The pneumatic circuit is provided with a solenoid valve connected, for its operation, to the photoelectric cell 5.

15 The plant 1 is also provided with an atomization air circuit, which opens at the nozzles of the sprayers 6.

This atomization air emerges through lateral holes in the nozzles and atomizes the coating material to create a fan of regular shape.

The brushes or miscellaneous implements 7 are fixed to supports or arms 9 provided with articulated joints 10.

20 In the present embodiment, the articulated joints 10 comprise friction discs 30, which ensure controlled movement of the arms 9.

In this manner the arms 9 can be adjusted before filling the plant 1, to adapt it to the work to be carried out, for example by varying the pressure or the angle of the brushes or miscellaneous implements 7 to the profile bars.

The plant is also provided with an electronic data processor 11 which is connected to the loading conveyor 2, to the discharge conveyor 4 and to the photoelectric cell 5.

5 The supports 9 are also movable automatically, for which they are connected to the electronic processor 11.

In practice the brushes or miscellaneous implements 7 can automatically assume the most suitable position for each type of profile and/or can oscillate transversely to improve the naturalness of the finished product.

10 A suction unit 12 is also housed in the coating cabin 3 to maintain the cabin interior under slight vacuum and ensure that the sprayed coating material does not flow to the outside, but is instead conveyed to a filter unit.

The plant for decorating metal surfaces of the invention operates substantially as follows.

15 The profile bars to be treated are previously subjected to conversion treatment, after which a layer of coating material in powder form, for example of epoxy or polyester type, is deposited on their surface.

The profile bars are then heated to a temperature of 90-100°C to fix the coating to their surface.

20 The profile bars treated in this manner are deposited on the conveyor 2, which conveys them into the cabin 3 by making them pass through the photoelectric cell 5.

These profile bars are of very large length (about 6.5 metres) and are therefore conveyed resting on one or on both the conveyors 2 and 4, but are not supported between the conveyors 2, 3.

The photoelectric cell 5 informs the processor 11 of the presence of the profile bars to be treated and at the same time operates the solenoid valve, which opens the pneumatic circuit.

In its turn, the pneumatic circuit displaces the pipe closure piston and
5 commences the spraying of coating by the sprayers 6.

The sprayers 6 deliver either coating material in diluted powder form or liquid coating material.

At the same time the atomizing air flow is also activated, its pressure being adjusted on the basis of the coating material viscosity.

10 The quantity of coating material deposited on the profile bars depends both on the operating air pressure and on the speed of the conveyors 2, 4, which also influences the veining finish.

These parameters can be adjusted to optimize the decoration.

The profile bars then pass through the region comprising the brushes
15 or miscellaneous implements 7, which are positioned and moved in a suitable manner to form the wood veining.

The brushes or miscellaneous implements 7 are arranged to spread the coating material to form veining of wood type.

The sprayers 6 and the brushes or miscellaneous implements 7 are
20 arranged in succession and, for example, are mutually aligned; in addition, their position and their pressure on the coating can be adjusted by means of the articulated joints 10 of the arms 9.

The brushes or miscellaneous implements 7 can also oscillate or rotate relative to the profile bars, to produce veining of the required
25 characteristics on the profile bars.

The electronic processor 11 controls all the devices of the plant 1, which is therefore completely automated and programmable.

In this respect, the plant requires the intervention of operators only for the initial setting and for depositing the profile bars on the conveyor 2 for
5 treatment, or for removing them from the conveyor 4.

In a different embodiment the plant of the invention is not provided with the electronic processor 11.

In this embodiment all the commands and adjustments effected by the electronic processor 11 are made manually.

10 In addition, the distance between the conveyor belts 2, 4 can be varied to adapt it to the various type of product to be treated or to profile bars of different lengths.

A plant similar to that described can also be used for coating profile bars or articles in a vertical position.

15 In that embodiment the sprayers 6, the brushes or miscellaneous implements 7 and the suction fans 12 are mounted on a carriage, which moves vertically within the coating cabin 3 with suitable speed relative to the advancement of the profile bars.

The plant of the invention also enables decorations to be produced
20 which simulate various natural products provided with veining, for example marble, hard stone, etc.

It has been found in practice that the plant for decorating metal surfaces of the invention is particularly advantageous because it enables work of very high quality to be carried out, which is not only constant with time but
25 is very economical compared with traditional process.

The plant also considerably increases the safety of the process operators and achieves a very high production rate.

The plant for decorating metal surfaces conceived in this manner is susceptible to numerous modifications and variants, all falling within the scope
5 of the invention; moreover all details can be replaced by technically equivalent elements.

In practice, the materials used and the dimensions can be varied according to technical requirements.

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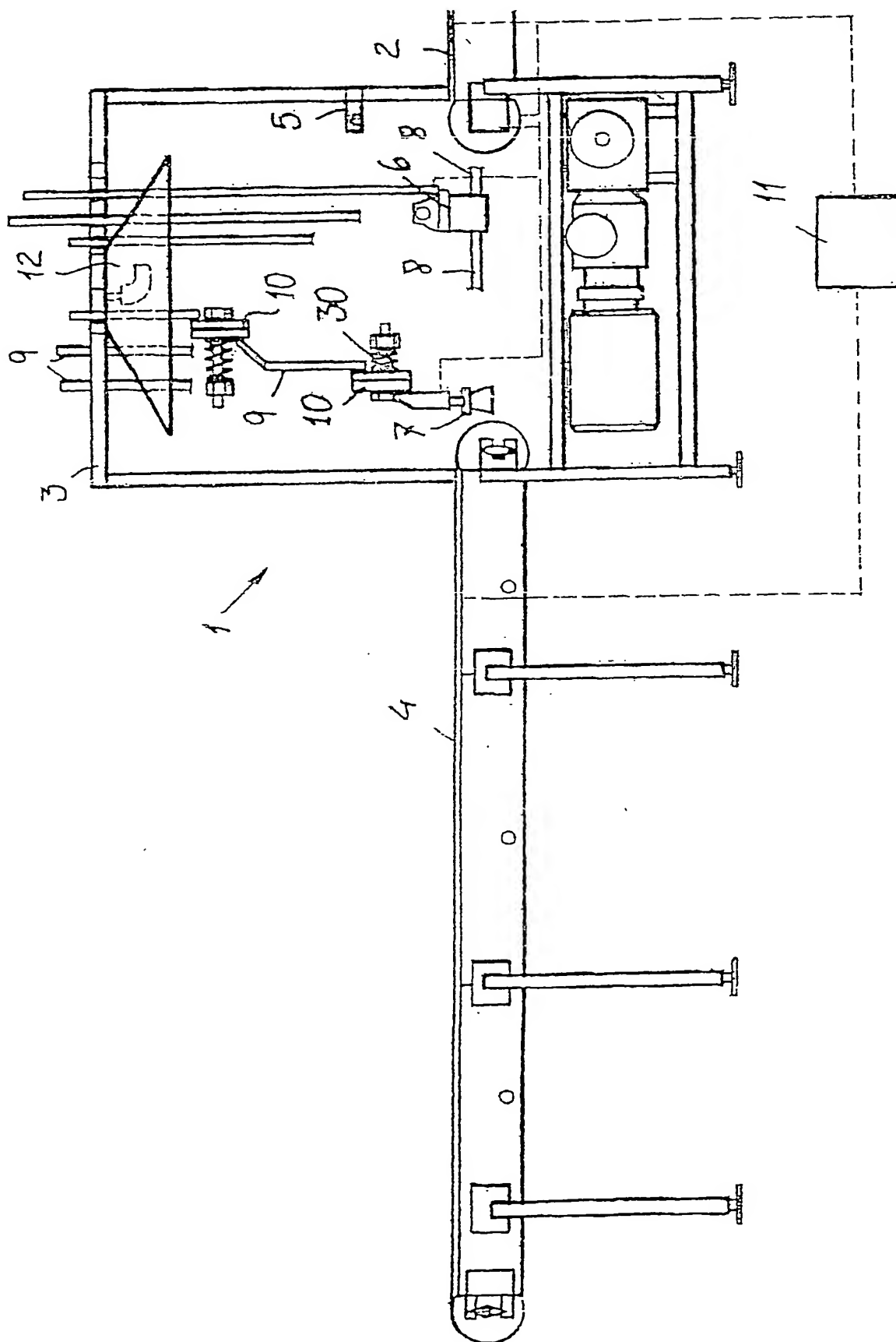
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C L A I M S

1. A plant (1) for decorating metal surfaces, characterised by comprising first means (6) for depositing a coating material on a surface to be decorated, and second means (7) for spreading said coating material to form a predetermined
5 decoration, said first means (6) and said second means (7) being arranged to operate in succession.
2. A plant (1) as claimed in claim 1, characterised in that said first means (6) and second means (7) are housed in a coating cabin (3).
3. A plant (1) as claimed in one or more of the preceding claims,
10 characterised in that said coating cabin (3) is associated with a suction unit (12) which maintains its interior under slight vacuum and ensures that said sprayed coating material is conveyed to a filter unit.
4. A plant (1) as claimed in one or more of the preceding claims, characterised by comprising third means (5) arranged to sense the presence
15 of profile bars to be decorated, in order to operate said first means (6) and/or said second means (7).
5. A plant (1) as claimed in one or more of the preceding claims, characterised in that said first means (6) and/or said second means (7) are connected to an electronic processor (11).
- 20 6. A plant (1) as claimed in one or more of the preceding claims, characterised in that said first means (6) comprise at least one sprayer connected to a coating material container.
7. A plant (1) as claimed in one or more of the preceding claims, characterised in that said second means (7) comprise at least one brush or
25 miscellaneous implement, arranged to form veining of wood type on said articles.

8. A plant (1) as claimed in one or more of the preceding claims, characterised in that said brushes or miscellaneous implements (7) are supported by supports provided with articulated joints (10), which enable their position to be optimized.
- 5 9. A plant (1) as claimed in one or more of the preceding claims, characterised in that said third means (5) comprise at least one photoelectric cell.
10. A plant (1) as claimed in one or more of the preceding claims, characterised in that said coating cabin (3) presents at least a first conveyor (2) for feeding into its interior said profile bars to be decorated, and a second conveyor (4) for removing said decorated profile bars from its interior.
11. A plant (1) as claimed in one or more of the preceding claims, characterised in that the distance between said first conveyor (2) and said second conveyor (4) can be varied, to adapt it to various types of product to
15 be treated or to profile bars of different lengths.
12. A plant (1) as claimed in one or more of the preceding claims, characterised in that the speed of said first and second conveyor (2, 4) and/or the quantity of coating material delivered can be adjusted.

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INTERNATIONAL SEARCH REPORT

Int onal Application No

PCT/EP 01/09106

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 B05C11/02 B05B13/00 B05D05/06 B05D3/12

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B05C B05B B05D B44F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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X	GB 1 339 659 A (ORLOVSKY NII LEGKOGO MASH) 5 December 1973 (1973-12-05) page 3, line 113 -page 4, line 9 ---	1-4,6,7, 9
X	GB 348 272 A (GEORGE GIBSON THORPE;MELLOWES & COMPANY LTD) 14 May 1931 (1931-05-14) page 4, line 26 - line 40; figure 6 ---	1-3,6-8
X	US 4 040 384 A (LATTNER ELMER A) 9 August 1977 (1977-08-09) column 3, line 34 - line 59 --- -/-	1,6,7

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INTERNATIONAL SEARCH REPORT

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP 01/09106

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